ESRM 350

Generalists and Specialists: The Case of Bobcats and Lynx

Autumn 2014

"A specialist is someone who does everything else worse"

- Ruggiero Ricci, 20th Century American violinist

Dietary Specialists and Generalists

- At the *species* level
  - **Generalist** – species that subsists on a wide range of food types
  - **Specialist** – species that relies largely on a narrow range of food types (sometimes just one)

- *Within* populations
  - **Individual generalist –** individual whose diet breadth matches that of the population
  - **Individual specialist** – individual whose diet breadth is restricted relative to that of the population

Bolnick et al. (2003) *American Naturalist*

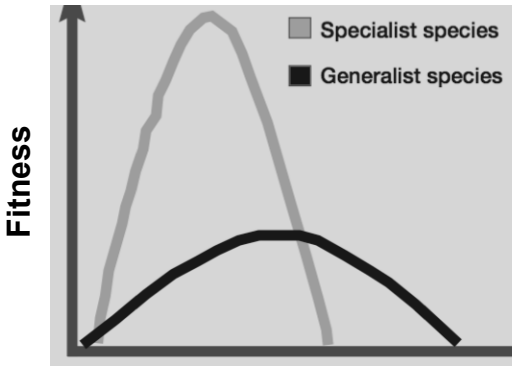
Dietary Specialists and Generalists

- At the *species* level
  - **Generalist** – species that subsists on a wide range of food types
  - **Specialist** – species that relies largely on a narrow range of food types (sometimes just one)

- *Within* populations
  - **Individual generalist –** individual whose diet breadth matches that of the population
  - **Individual specialist** – individual whose diet breadth is restricted relative to that of the population

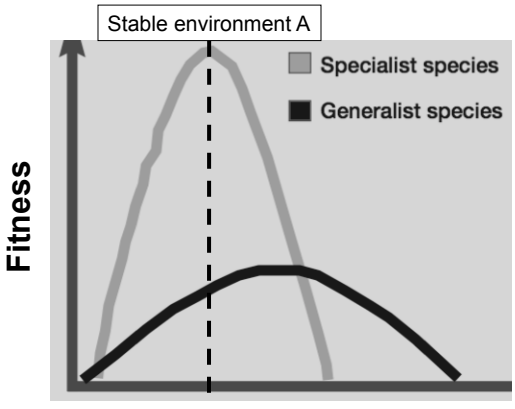
Bolnick et al. (2003) *American Naturalist*

Who Fares Better?



Clavel et al. (2011) *Frontiers in Ecology and the Environment*

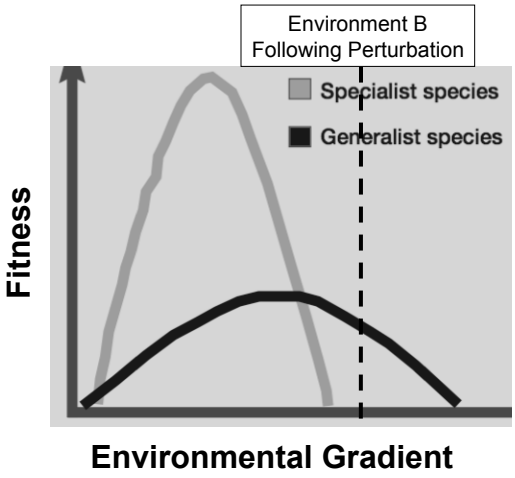
Who Fares Better?



- In stable environments
  - specialists have the competitive advantage
- Higher fitness (reproductive success) stems from
  - increased foraging efficiency (get really good at exploiting a few food types)
- Thus, over evolutionary time
  - generalists have tended to transition into specialists*

*Nosil (2002) *Evolution*

Who Fares Better?



- But, world is rarely stable for long
  - the environment is dynamic
- Environmental change favors generalists
  - a "Jack of all trades" can make a living under many conditions
  - specialists are less adaptable
- Thus, generalists remain common

What Does the Future Hold?

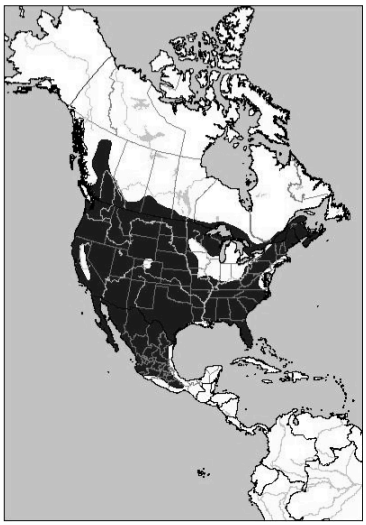
- In the modern era, environments are becoming increasingly dynamic
  - volatility caused by **habitat loss and fragmentation, invasive species, climate change**
- Upheaval accompanied by worldwide decline in specialist species*
  - Important ecologically
    - many specialists perform unique ecological functions (e.g., pollinators, control of prey species immune to other predators)
  - Important for conservation, too
    - do we prioritize specialists?

*Clavel et al. (2011) *Frontiers in Ecology and the Environment*

For Today: Bobcats and Lynx in a Changing World

http://dsc.discovery.com/tv-shows/north-america/videos/bobcat-stalks-a-pocket-gopher.htm

Bobcat (*Lynx rufus*)

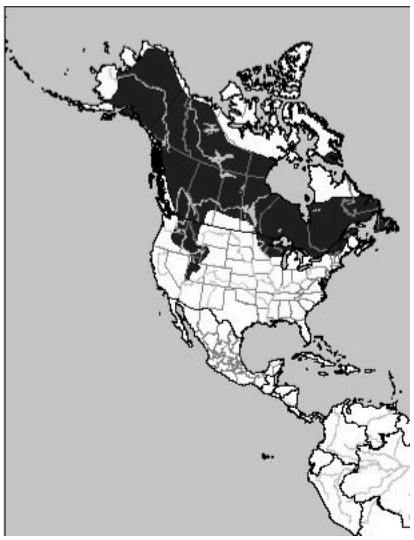


- A "mesocarnivore", or medium-sized carnivore (6-13 kg, or 13-30 lbs)
- Named for 'bobbed' tail
- Broad NA distribution
  - can occupy a diversity of landscapes, including montane forests, scrubland, swamps, deserts, and even the urban fringe (incl. outside Seattle)
- Diet is broad (a **generalist**)
  - leporids, small mammals, birds, bats, deer

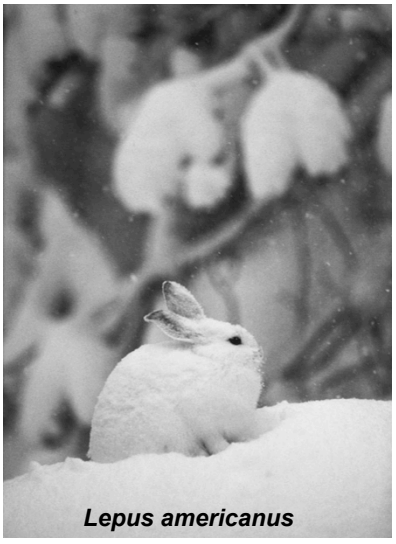
http://www.youtube.com/watch?v=B-Y80h31Axw

Canada Lynx (*Lynx canadensis*)

- Size similar to that of bobcat (5-17 kg, 11-38 lbs)
- Not "Canadian" lynx
- Dense, silvery-brown fur for life in a cold climate
- HUGE feet for treading on snow
  - common across snowy boreal forests of Canada and Alaska
  - not found where deep winter snow is lacking



The Lynx is a Dietary Specialist



Lepus americanus

- The lynx diet typically consists of > 60%, and up to 100%, snowshoe hares*
- Other prey: red squirrels, ground squirrels, grouse
  - but lynx can't last without hares
  - especially during winter
- Lynx are effective hare predators in winter
  - Can pursue hares through deep snow (low *footload*)
  - Unlike competing mesocarnivores (bobcats, coyotes)

*Roth et al. (2007) *Ecology*

Telling Them Apart

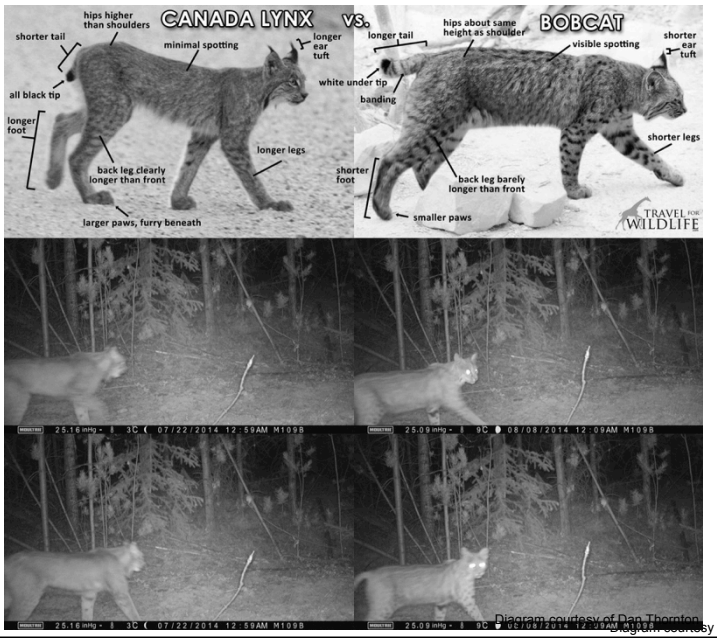


Diagram courtesy of Dan Thornton

Diagram courtesy of Michigan DNR

Bobcat Population Trends

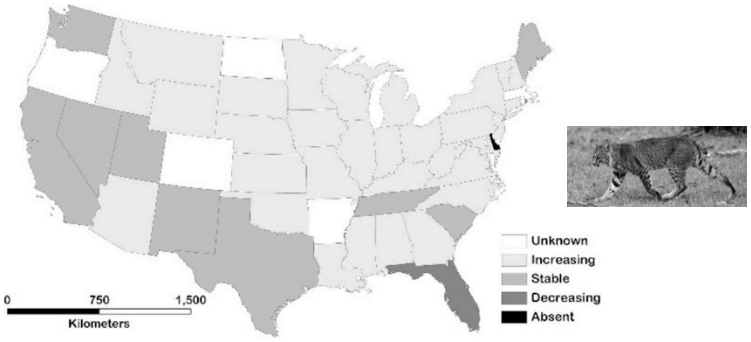


Figure 1. Bobcat population trends in the contiguous United States, 2004.

- Bobcat numbers are stable or increasing in most states; why?
  - better management of furbearer harvest (take unregulated as recently as 1970s)
  - ability to cope with anthropogenic landscape modification (note increases in many east coast states); e.g., found in agricultural lands

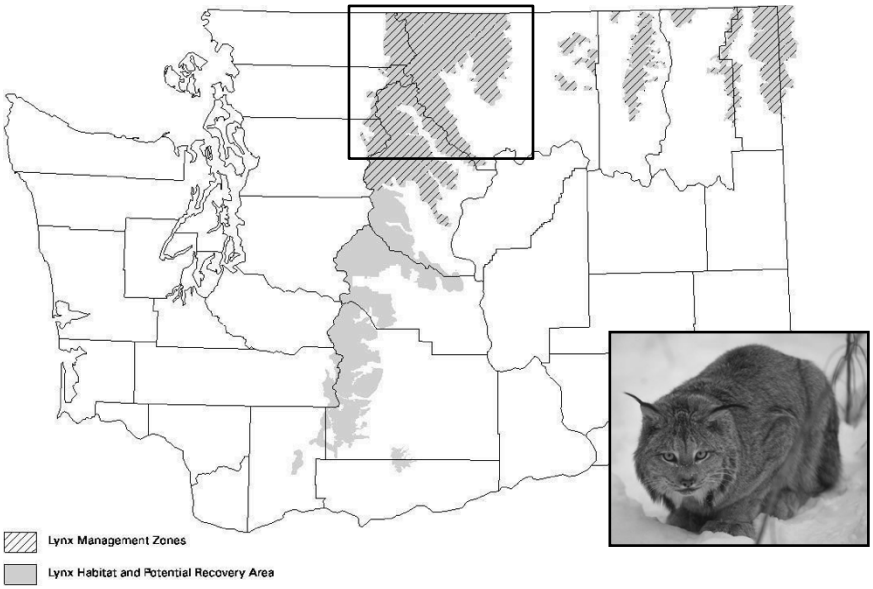
Roberts and Crimmins (2009) *Journal of Fish and Wildlife Management*

Lynx Population Trends

- Lynx numbers in the contiguous USA have declined over the last several decades
  - listed as Federally Threatened in 2000 (Endangered Species Act)
  - exact estimates difficult because harvest has ceased
  - Why? In part because of rapid environmental change
    - Forest loss, fragmentation due to timber harvest, fire, infestation
    - In winter, lynx can't use deforested areas (no hares); if deforestation is widespread, lynx disappear (unlike bobcats)



Current Lynx Range in WA



Current Lynx Range in WA